CONFIDENTIAL

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INDUSTRIAL COMMISSION

INSPECTION NOTES

1916-18

CALCUTTA
SUPERINTENDENT GOVERNMENT PRINTING, INDIA
1918

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Introductory Note.

These notes do not profess to be authoritative, nor do they represent the unanimous views of the Commission. They have been written by various Members, and indicate briefly some of the most interesting features of the places visited and their bearing on the general industrial question.

G. H. W. DAVIES,

Secretary.

SIMLA:
The 26th April 1918.

[*Confidential.*]

INDIAN INDUSTRIAL COMMISSION

Inspection Notes

1916-18

THE DELHI BISCUIT FACTORY.

Visited 26th October 1916.

This factory was started about 1898 and was under the management of an experienced Scotch biscuit-maker. Although the capital was only Rs. 61,000, the company did fairly well till the Directors thought that they could dispense with the services of the expert and depend only upon their locally trained men. The result was not altogether a success, as the quality of the biscuits fell off, and consequently the demand decreased. This was reflected in a very serious diminution in the profits. Lately, since the war began, the factory has obtained large contracts for army biscuits and has been making excellent profits.

The factory is a comparatively small one and consists of a single unit of biscuit-making machinery manufactured by the firm of D. Thomson of Edinburgh. The maximum capacity of the plant is about 4,000 pounds of biscuits a day. The factory was in a very clean condition, but, in the opinion of most members of the Commission, there was too much handling of the material at the various stages of manufacture. The equipment appears to be satisfactory; but, judging from the accounts, the expenditure on fuel is excessive. The ovens are heated by high-pressure steam, and there is a separate steam plant for generating power. There is also a small tin-making plant which is sufficient for the existing scale of operations.

The army contracts keep the factory going; but previously it was not run more than half-time, and sometimes only one-third time. The products of the factory are not good enough to supplant the high-class biscuits imported into India from England and Australia, whilst they are not cheap enough to command a large Indian market.

The Directors take a great pride in the large number of biscuits they are able to make; but from a business point of view the result would probably be very much more satisfactory if they confined their efforts to producing a much smaller number of kinds of biscuits. The cost of packing the biscuits in tins is considerable, and they might be put on the market at much lower prices if packed in paper bags similar to those adopted by some of the biscuit-makers at Home.

The factory is a sound concern and appears to be capable of considerable development.

DELHI INDUSTRIES.

Visited 28th October 1916.

The Commission visited the show-rooms of Fakir Chand and Rughnath Das, opposite the North Gate of the Jumma Masjid, and found behind the comparatively modest exterior very extensive show-rooms, well stocked with the non-textile art products of Northern India. The chief exhibits were the well-known Delhi ivory carvings and miniature paintings on ivory. **Ivory.**

No opinion need be expressed regarding the artistic merits of the work as that has frequently been done by art critics. The ivory is imported from Africa, and no Indian ivory is used, as the latter is stated to be liable to crack and warp. Some workmen were seen engaged at their craft, in which they have attained a very high degree of skill. The members were generally of opinion that nothing could be done with this particular branch of industry.

The proprietor said that he did not know the value of his stock; but it must have amounted to several lakhs of rupees. The ratio of turn-over to capital invested is probably very small, and the prices charged in proportion to the cost of the work are, therefore, very high.

It may here be noted that firms like Messrs. Fakir Chand and Rughnath Das would certainly be very strongly opposed to the establishment of any kind of official depôt in Delhi for the sale of Indian art wares, such as has been established in Madras and Mysore.

Delhi is celebrated for its jewellers, and the processes of gem cutting were inspected. These do not differ materially from those employed in Europe. Diamonds are neither cut nor polished in Delhi; but stones for Indian jewellery are obtained from Benares. Rose diamonds and brilliants are invariably obtained from London, also amethysts and topaz, the cutting of which apparently the Delhi workmen do not understand, and they are procured from such firms as Messrs. Liberty and Coke. Emeralds, chiefly uncut stones, are obtained from Europe, and rubies from Burma, yellow, white, and blue sapphires, moonstones, alexandrites, and opals from Ceylon, but the best opals come from Australia. Large pearls are obtained from the Persian Gulf and seed pearls from Ceylon, whilst turquoises, of which great numbers are used, are brought from Persia and Tibet.

The most important indigenous industry in Delhi is wire drawing and the preparation of gold lace. No less than 40,000 people are said to be still dependent for a livelihood upon one or other of the various branches into which it is sub-divided. In no one workshop are the whole of the processes carried out, and the various stages of manufacture were witnessed in four different shops.

In the first, a cylindrical rod of silver, pointed at both ends, approximately one inch in diameter and weighing 100 tolas, is first covered with a very thin sheet of gold weighing one tola. This is carefully wrapped round the silver rod, which is then heated to redness in a charcoal fire and the thin layer of gold sweated on to the silver. The rod is then drawn through steel dies, gradually diminishing in diameter, till a comparatively fine wire is produced, coated with a thin film of gold. The latter stages of wire drawing were seen in a separate workshop, where the dies used were made of rubies pierced with a very fine hole. The art of boring these rubies seems to have been lost, as the dies are now all obtained through a firm at Surat which imported them from Europe, and probably from Germany. Before the war they cost about 12 annas each, but the present price is Re. 1-12-0. The life of the die is very short; some fail almost immediately, but good ones will suffice for drawing 100 tolas of wire. Special machines are made at Lyons for boring holes, and it is possible that they might be introduced into Delhi with advantage. Obviously, however, a competent workman would have to be brought out to teach the local people how to use the machines.

In a third workshop, the fine wires wound on reels were mounted six on a board and drawn over a highly burnished curved steel plate on which they were hammered into flat ribbons.

In a fourth workshop, the flat ribbons were wound spirally on to a silk thread covering the same completely. A distaff is employed, which is spun rapidly by the workman with one hand, whilst with the other the fine ribbon is wound on to the rapidly rotating silk. Alternately he spins the distaff and feeds the ribbon, and then winds up the length of silk covered with the gilded ribbon.

The processes throughout are primitive in the extreme, and have long ago been superseded in Europe by very elaborate and delicate machinery. Apart from the use of machinery in Europe for carrying out the operations which in India are done by hand, the principal difference in the method employed is that in Europe the gilded surface is produced, as a final operation, by electroplating in a bath, through which the threads covered with the silver ribbon are drawn. It is asserted that the articles so produced are inferior to those made by hand in India, and this is probably true, as, for the sake of cheapness in production, the film of gold deposited by electroplating is probably thinner than that on hand-drawn wire. There is, however, no reason why the coating of gold given by electroplating should not be as thick.

It is, however, possibly open to question whether the method of electroplating is as good as the method of sweating the gold on to the silver, which is employed in India. The advantage of the European method is that the layer of gold is deposited only where it is wanted, whilst in the Indian method, the gold is on both sides of the ribbon.

In Delhi, they do not appear to manufacture extremely fine gold lace, which is now so very largely imported from Lyons and which is used in the manufacture of gold lace cloths. It is probable that the Indian method is too costly for the fine work. The silk used is imported from China, as Indian reeled silk is too irregular and full of knots.

It appears that five and twenty years ago two men, Maitab Rai and Chuba Mall of the Chowri Bazar, imported a power-driven wire-drawing bench and accessories from England. It is said that they employed a German workman to superintend the factory; but owing to the incompetence and dishonesty of the man employed, the factory proved a failure. The plant was driven by a steam engine, and more than Rs. 70,000 was expended on the experiment. Some of the machines including the long draw bench and the lines of shafting are still in existence; but the workshop is now used as a stable. It is too late to ascertain the real cause of failure. The plant appears to have been much too heavy for the class of work, and it was probably from the very outset unsuited for the wire-drawing done in Delhi. It is almost certain that this is an example of Indian enterprise which ended in failure because it was undertaken without competent technical advice.

FACTORY OF THE DIXON CHEMICAL CO., DEHRA DUN.

Visited 2nd November 1916.

At the outbreak of the war, the fact was very widely advertised that the only source of supply of thymol was in Germany, whilst India had a practical monopoly of the supply of raw material—*ajawain* seed. The preparation of thymol engaged the attention of Mr. Puran Singh, the Chemist of the Forest Research Institute at Dehra Dun, and it seems almost certain that the Dixon Chemical Company have established their factory in Dehra Dun so as to be near the Research Laboratories. The plant for distillation is established in an ordinary bungalow and is obviously the work of amateurs. Nevertheless, thymol is produced, and apparently of as good quality as was formerly available from Germany. Naturally, the managers were somewhat reticent regarding the details of the processes. They stated that they were making 1,000 pounds of thymol a month, the current wholesale price for the same on the London market being about 33 shillings a pound. It is open to question whether the capacity of the plant at work at the time of the Commission's visit was as large as was stated, and it is probably an anticipation of events, as we were shown a very much larger still which has recently been constructed for the company in Bombay.

The *ajawain* seed after removal from the stills contains about 20 per cent of oil, for which possibly some commercial use may be found. The crushed seed is an excellent food for cattle, and independent testimony in Dehra Dun was forthcoming as to its value as food for horses that were out of condition. This is not an unimportant matter, as, with so small a yield of thymol, it will probably be necessary to make the most of the by-products.

MATCH FACTORY, BAREILLY.

Visited 3rd November 1916.

In the note on the match-making industry supplied by the Government of the United Provinces to the Commission, a brief history is given of the enterprise initiated by Messrs. Gavin Jones & Son of Cawnpore, the outcome of which is the match factory now working at Bareilly, which was inspected by the Commission. At the time of our visit, the factory, working ten hours a day, was able to turn out 750 gross of boxes of matches a day, and the Managers stated that its capacity will have to be doubled before it can be expected to yield profitable results. The wood used, both for boxes and splints, is *bombax malabaricum*, the Indian cotton tree. For boxes it is said to be satisfactory, but it yields only splints of an inferior quality. Attempts are now being made to secure a supply of blue pine, experiments with which have yielded much better results. All the machinery is of German manufacture, and even now it is being run under the supervision of a German mechanic, who has been specially released from internment for the purpose. This class of machinery is not likely to have a long life, and, at any rate, renewals and repairs will probably prove difficult and costly.

The match trade in India has in recent years undergone considerable changes, partly due to legislation against the use of white phosphorus and partly due to the war, which has enabled Japanese matches to oust Swedish matches to a large extent, whilst the supplies which formerly came from hostile countries have been entirely cut off. The price of Swedish matches has risen considerably, but Japan has been able to place on the market enormous quantities of inferior matches at practically pre-war prices. The Bareilly matches appear to be of about equal quality to the Japanese, but are distinctly inferior to those imported from Sweden. The price at the present time is annas fifteen a gross, a rate which would yield a good profit, were it not for the heavy expenses due to the enhanced prices which have to be paid for chemicals and paper.

The factory is supplied with wood from the Forest Department at one anna per cubic foot, which is less than its value as fire-wood. All the chemicals used are imported, also the paper wrapped round the boxes. The economic advantage to India from the establishment of the match industry is therefore comparatively small, and the only valid reason for granting concessions to this factory is the possibility that ultimately it may prove a commercial success; and India may be rendered to some extent independent of foreign countries for supply of matches.

There have been many attempts during the past ten years to make matches in India, but so far with but limited success, owing to the inferior character of the wood, and much money has been wasted. Any further assistance rendered by the State for the establishment of match factories should be concentrated on one concern, which obviously should be that which offers the best prospects of final success. As the conditions under which the other pioneers of the match industry are working are not known to the Commission, it is not certain that the Bareilly Match factory should be selected as the most deserving of further Government assistance.

FURNITURE WORKSHOPS, BAREILLY.

Visited 3rd November 1916.

One of the largest furniture factories in Bareilly was inspected by the Commission. The work was of the average quality to be found in similar factories in many of the large towns and cities of India. Bareilly enjoys the advantage of cheap supplies of wood of a rather good quality for furniture, and there are a large number of artisans engaged in the industry of furniture-making. Judged by modern standards, their designs are inferior and their workmanship second-rate, whilst, the tools they employ are of the usual primitive type to be found among the indigenous carpenters.

A second furniture factory was inspected, which is run by a Co-operative Society, consisting of members who have subscribed among themselves for 53 shares of the value of Rs. 50 each. The Board of Directors of the Co-operative Society acts as a sort of middleman and distributes the orders received among some of the members, who work on the premises of the Society. Piecework appears to be universally employed, and the accounts of the Society showed that it had made a profit sufficient to allow of the distribution of a dividend of

10 per cent on the shares and bonus of 6¼ per cent on the piecework money paid to the operatives. The Co-operative Society has borrowed something like Rs. 28,000 from the District Urban Bank, and it can scarcely be questioned that the advances made by the Bank to the Society are altogether out of proportion to the capital which the Society controls. The funds are invested in a building used as a show room, which contains stock valued at an amount equal to at least one year's output of the work of the Society. The actual cabinet making is carried on in a very *kutcha* shed in the compound, and it is hard to discover what useful purpose the Co-operative Society has fulfilled. As a trading concern, its position is unsound, and it is quite certain that the funds of the District Urban Bank will not be easily recoverable.

This Co-operative Society may be regarded as an attempt to apply co-operative methods of working in an industry not needing such, and the Board of Directors has apparently been unable to achieve any useful result. Unless some drastic measures are taken to put the Society on a sounder basis, the inevitable winding up, which looms in the future, will involve the District Bank in a very heavy loss.

The control of the Society is in the hands of people who have no knowledge of the trade, and they also control the funds of the District Bank. This should not have been allowed, as the Directors of the Bank will probably be tempted to throw good money after bad to keep the Co-operative Society going. The solvency of the Society, at the present moment, entirely depends upon the sale value of the stock, and there is an inevitable tendency in all such factories to accumulate a certain amount of stock which is either unsaleable or can only be disposed of at considerably reduced prices. Owing to the direction of the Bank and the direction of the Society being in the same hands, there is an entire absence of healthy criticism of the management.

GOVERNMENT CARPENTRY SCHOOL, BAREILLY.

Visited 3rd November 1916.

Bareilly is the centre of a large trade in cheap furniture and, some five or six years ago, a Government School of Carpentry was started with a view to improving the technique of the workmen. An English carpenter of experience was brought out and made the superintendent of the School, which was placed under the management of a local committee presided over by the Commissioner of the Division.

The School is under the Education Department; but the control is practically in the hands of the Director of Industries, who inspects the School and is a member of the local committee. The policy of the School, the design of the buildings and the nature of the equipment appear to have all been determined by the superintendent, and to have been approved by the various authoritie over him. A very large amount of money has been spent. Good workshops and class rooms have been built, and the equipment is beyond all comparison better than that of any other industrial school of the same character in India.

Boys are admitted to the School for a course of training extending over six years, but as yet there is no record of passed pupils to show whether the objects of the School have been achieved. The course of training is obviously too long, and it is doubtful if the School has been a remarkable success, which is the opinion expressed by the local Director of Industries; in fact, it is open to question whether the School is not working on altogether wrong lines, and attracting a class of pupils who will ultimately find as much difficulty in making a living as carpenters, as will their contemporaries who are receiving a purely literary education.

It is noteworthy that the sons of the artisans working as carpenters in the town are not attracted to the School and that the boys mainly come from other classes. Granted the fact that the artisans are in need of a better training and that the wood-working industry in Bareilly is not in a flourishing condition, it seems hardly rational to introduce a new class of carpenters who, if they succeed, will oust the present workmen from their trade. We may accept the fact that it is difficult to get high-class furniture made in the United Provinces; but it is more than doubtful if there is any large demand for expensive cabinet work. A comparatively small number of first-class master carpenters would, at any rate, supply for some time to come the immediate demand.

We were informed that the annual cost of maintaining the School is about Rs. 37,000, of which apparently Rs. 6,000 or 7,000 is recovered by the sale of work done in the School. As the number of pupils in the School is now about 70, the cost of training each boy comes to about Rs. 35 a month, that is to say, if the boy goes through a six years' course, his training will cost the State about Rs. 2,500, which can only be regarded as an extravagant amount to pay for the education of a carpenter.

The School is said to influence the artisans in the town indirectly; but little evidence of this could be seen in the factories which the Commission inspected. A radical change in policy seems to be indicated, chiefly with a view to bringing the resources of the School to the aid of the artisans in the town. There is a large amount of wood-working machinery in the School, the capacity of which must be greatly in excess of the requirements of the School, and this should be employed for the benefit of the cabinet-makers in the town, who might be allowed to get work done at such rates as would yield a reasonable profit. The saw mill might be used to convert logs into suitable scantlings, and these could be stocked in large quantities, as would be done in any timber yard.

It is understood that the purchase of a wood-seasoning plant is under contemplation, and this might certainly be installed so that seasoned wood could be supplied to the artisans in Bareilly.

The majority of the boys in the School should be the sons of artisans in the town, and to attract them to the School, it will be necessary to pay them wages from the very beginning. This should be done, and the boys put through a course of instruction in carpentry, and as soon as they acquire sufficient handicraft skill, they should be employed on the manufacturing of things for sale. Such a course need not extend over a period of more than three years.

A comparatively small number of boys, certainly not more than five a year, might be admitted to go through a more diversified course of instruction in wood working. Such boys should have completed a good elementary education, as would be indicated by their having obtained a School Final or School-Leaving certificate. The training for these boys should be much on the same lines as that now given to everyone in the School; but shortened, so that it would be possible for one, if not two years of the course, to be spent in the Lucknow School of Arts and Crafts, where more attention is paid to instruction in designing. If the School is working in the town for the benefit of the artisans in the town, it is not unreasonable to attempt to recover as much as possible the working costs by the sale of the products of the School. No doubt, the School would compete with private enterprise in a sense, but such competition should be a stimulus rather than otherwise to the industry.

Since the above note was written, the superintendent of the School has furnished a statement showing that the capital outlay on buildings up to date is Rs. 73,095, and that the expenditure on tools and machinery is Rs. 41,045. During the year 1915-16, work to the value of Rs. 8,280 was done for other Government departments, and ambulance boxes were supplied to the value of Rs. 2,183. Further, work valued at Rs. 2,440 for the improvement of the buildings and equipment of the School was completed during the year.

THE UPPER INDIA PAPER MILLS, LUCKNOW.

Visited 4th November 1916.

These mills were started in 1879 and manufacture paper chiefly from *baib* grass. Other sources of raw material are old gunny bags and other waste materials suitable for the purpose. The paid-up capital of the company is 8 lakhs of rupees and during the last eight years, it has paid an average dividend of 7 per cent. The outturn of paper is about 13 tons a day and two Fourdrinier machines are in use.

The company is entirely an Indian concern but employs four European foremen. The work is carried on continuously and there are two shifts. Only low qualities of paper are manufactured and the directors are apparently content to continue running the mills on the restricted lines which they have found to be moderately successful. There was not the slightest trace of scientific control nor any signs of development.

THE SCHOOL OF ARTS AND CRAFTS, LUCKNOW.

Visited 4th November 1916.

The Fine Art classes of this School are on a restricted scale and the pupils, who do not show fair promise, are quickly eliminated. The lithographic class is an important section and has recently been put under an expert brought out from home. The principal crafts taught in the School are wood working and design, wood carving, gold and silversmith's work, brass and copper work and sign painting. Excluding the purely art sections, about two-thirds of the pupils are following their hereditary occupations. The School has only been in existence for five years, which is far too short a period to produce results which may be judged. It is run on the same general lines as are followed in the schools of arts in Madras and Bombay and there is no reason to doubt that it will meet local requirements with equal success. It will probably be found advantageous to link up this School with the various industrial schools throughout the province and to draft some of the more promising artisan apprentices into this School for a course of training in design. Above all things, the arts craftsmen require intelligent instruction in this direction as they are now completely out of touch with the environment of their patrons.

Attached to the School, there is an Arts and Crafts Museum containing many excellent specimens both of Indian and foreign work. It is needless to say that this should prove of great value to the students, but it would be of advantage if the best specimens of work turned out in the School were placed in the Museum rather than a comparatively small income derived from their sale. The same idea should be followed in every industrial school to the extent possible with the resources at the disposal of the management. Schools of arts and crafts such as this at Lucknow are essentially educational institutions, and though there is no objection to the sale of work done in the school, it should not be regarded as an important source of income. These remarks do not apply to the lithographic section, the success of which may to some extent be measured by the amount of commercial work the pupils are able to turn out.

The question will possibly come up for consideration as to whether or not it will be desirable to establish Government workshops of arts and crafts to be run on purely commercial lines. At the present time, the tastes of the wealthy people in India incline towards the productions of Europe and they look with contempt on the indigenous arts and crafts ; on the other hand, in Europe and America there is a large demand for art work such as can be turned out in India, and it is probably sound policy to take steps to meet the demand. The dealers in art curios have had a most disastrous influence, and it is necessary, if the craftsmen are not to degenerate further, that they should be brought into touch with more appreciative patrons.

It may be suggested that more attention might be given in Lucknow to training in the decorative arts. A good deal of money is now being spent abroad on these which might well be retained in the country.

THE MECHANICAL ENGINEERING SCHOOL, LUCKNOW.

Visited 4th November 1916.

This School was started in 1900 and has been continuously under the superintendence of Mr. Swinchatt. From a very elementary industrial school it has developed into one of much higher grade for the training of men who in after-life will be in charge of small engineering plants or foremen of departments of mechanical engineering establishments. The equipment is on an extensive scale, and both steam engines and internal combustion engines are installed either for experimental purposes or for driving the workshops.

The pupils undergo training in the School for three years, and they are then apprenticed in engineering works for two years, during which time they are paid Rs. 8 a month by Government, and their employers are expected to pay them a minimum wage of Rs. 12. At the end of the five years, those who have passed through the course satisfactorily are granted the diploma of the school. The scheme has only been in operation for six years, and a sufficient number of students have not yet passed into practical life for any opinion to be formed as to the nature of the results achieved. Such evidence as is available regarding the utility of the School is all in its favour, and there is but little doubt that the men will easily find employment and will be of material assistance in the development of small rural factories for the preparation of agricultural produce for the market.

There is a machine-tool shop, a pattern maker's shop, a foundry, a fitter's shop, a forge, and electrical plant sufficient to familiarise the pupils with the running of dynamos and motors. The underlying idea of the education given in the School seems to be to turn out a class of artificers, the nearest equivalent of which is the English millwright. Experience in other provinces suggests that there is a need for such men.

Only a detailed study of the curriculum of the School would justify a definite expression of opinion as to its appropriateness to the end in view. Possibly, too much time is spent in the machine-tool shop and too little at the forge and at the fitter's bench, where manual dexterity, so essential in the class of men under training, can be best acquired. The School is attended by boys from all parts of the province, and there is a hostel attached for their accommodation.

THE CAWNPORE WOOLLEN MILLS, CAWNPORE.

Visited 7th November 1916.

The Commission visited these mills under the guidance of Sir Alexander McRobert. He pointed out to the Commission that, so far as his knowledge goes, the mills are unique in regard to the variety of work which they undertake. Both woollen yarn and worsteds are spun and, in normal times, a great variety of fabrics are woven. In the early days of the mills, 90 per cent of the output was on Government account; but in late years, it has dwindled down to about 10 per cent. Since the outbreak of war, it has again risen to nearly 70 per cent. Beside the raw material available in India and imported from Tibet, wool is also imported from Australia and the Cape.

The mills are one of the largest industrial undertakings in Cawnpore and employ at the present time about 4,000 hands. The buildings and equipment are of a very modern type, and the manufactures of the company enjoy a high reputation throughout India. These mills are an excellent example of what can be accomplished in India under none too favourable conditions, when enterprise, technical skill and business aptitude are displayed to a very high degree in the development of a manufacturing business.

BRUSHWARE, LIMITED, CAWNPORE.

Visited 8th November 1916.

This is a comparatively small factory established about 20 years ago in Cawnpore for the manufacture of all kinds of brushes. The bulk of the output is to meet the requirements of the Military Department; but the company also manufactures every variety of household brushes and a very high grade of toilet brushes, the principal limitation in the latter branch being that only wood is used for backs. Pigs' bristles and a variety of suitable fibres are used. Considerable quantities of the former are obtained from China and after grading into various lengths, those unsuited for the local trade are exported to Europe. The factory is sufficiently equipped with machine tools but all filling of brushes is apparently done by hand. As regards quality and finish, the manufactures of the company appear to be equal to the best imported goods.

THE ELGIN MILLS, CAWNPORE.

Visited 8th November 1916.

These mills date back to 1864 and are among the earliest of the modern industrial enterprises of Cawnpore. They have lately passed from private management into the hands of a firm of managing agents. The cotton spinning is entirely confined to low counts, and the greater part of the yarn is worked up into finished goods within the premises of the company. Tents and *dhurries* are important items of their present output.

MESSRS. COOPER ALLEN & CO., LTD.

Visited 9th November 1916.

The factory, owned by this firm, is one of the largest establishments in Cawnpore, and was founded in the early sixties by a Mr. Cooper who was an indigo planter in Bihar. In the initial stages of its development it received considerable financial assistance from Government. The factory includes a very large tannery and a boot-making plant, which at the present time is supplying to the Military Department about 5,000 pairs of ammunition boots per day. A good deal of lightly tanned leather produced in Madras is re-tanned in the factory. The bulk of the tanning is done with *babul* bark whilst myrobalams are also used to some slight extent. The depletion of th local reserves of *babul* trees necessitates drawing supplies from an ever-increas ing distance, and the price of the bark appears to depend to some extent upon the demand for charcoal, as, when the trees are cut down and the bark stripped, the wood is converted into charcoal. In this connection, the possibility of establishing wood-distillation plants for the manufacture of charcoal and the recovery of the by-products seems to require investigation. At the same time, it is possible that the market for charcoal might be extended by the encouragement of the use of suction gas plants worked with charcoal to supply gas for power purposes. The company apparently relies upon Government business to keep going and has shown comparatively little enterprise in the development of outside lines of business.

Although a separate concern, the North-West Tannery is under the same management and here a very much greater variety of work is turned out, including bags, trunks, dressing and suit cases, a speciality being the manufacture of articles from crocodile skins, of which fairly large numbers can be procured in those months of the year when the neighbouring rivers are low.

THE GOVERNMENT HARNESS AND SADDLERY FACTORY, CAWNPORE.

Visited 10th November 1916.

This is a factory belonging to the Ordnance Department and entirely devoted to the manufacture of military equipment. The working is controlled by the officers of the Ordnance Department, who have specially elected for the service and have undergone a very thorough course of special training in the manufacture of leather and in the working of the same into military equipment. The inspection of the factory disclosed ample evidence of technical skill and administrative ability in the equipment and organisation. The factory is now worked under war conditions, and the output is considerably in excess of what is normal in peace times.

It has often been suggested that this factory was unnecessary and that it was an expensive way of providing for the needs of the Military Department in the matter of leather equipment. It should therefore be noted in justification of the policy hitherto pursued that there has been no increase in the cost of production since the outbreak of war and that the actual cost price of articles is from 25 to 37½ per cent below the rates at which private firms are willing to tender. After the outbreak of war, there was for a time a very heavy slump in the price of hides, and the total cessation of exports to Austria and Germany has tended to keep prices low. This has been further emphasised by high freight and insurance charges. The result is that up to date the cost of production of leather goods in India has not risen.

Attention was drawn to the leather belting turned out by the factory for other Government departments. Whilst perhaps not of the very highest quality, it is sufficiently good for most practical purposes and suggests that this branch of the leather trade might well be developed in this country. The value of the imports into India, including belting made of other fabrics besides leather, was as follows:—

	£
1912-13	245,246
1913-14	281,937
1914-15	239,791

With the development of industries, the amount required in the country will steadily increase. This may be counteracted to some extent by the increasing use of electro-motors for direct driving. For the generation of power steam is employed, the fuel used being the spent tan from the tan pits supplemented by other fuels. At the time of our visit, they were burning *mahua* cake obtained from the Premier Oil Mills. This cake should be useful as manure as it is said to contain over two per cent of nitrogen, but with such a low nitrogen content it will probably not bear any very heavy transport charges. We were informed that the *mahua* cake has been taken for fuel to help the Oil Mills to dispose of their cake, as the local demand for manure was not sufficient. The price paid for the cake was eight annas a maund.

Our attention was drawn to a very complete battery of drop hammers for stamping out the various forgings required in the factory. In one instance, it was stated that the cost of doing the work had been reduced from ten annas by hand labour to nine pies with the drop hammer.

ILLAGE SETTLEMENTS, CAWNPORE.

Visited 11th November 1916.

The improvement of the conditions of labour has received a considerab amount of attention in Cawnpore, and both the Cawnpore Woollen Mills an Messrs. Cooper Allen & Company have built very large settlements in which a considerable number of their employés are now housed. The Commission visited both settlements and were considerably impressed by the care and forethought displayed in their design. The settlements are within a reasonable distance of the factories with which they are connected and seem to afford a practical solution of the housing problem. Though the rentals received are only sufficient to yield a return of about one per cent on the capital invested, the proprietors are satisfied that the indirect return from the increased efficiency of the workmen living under more sanitary conditions justifies the outlay. The two settlements are roughly about the same size, and each provides housing accommodation for about 4,000 people.

THE CAWNPORE SUGAR WORKS, LIMITED.

Visited 12th November 1916.

This factory was not visited by the whole Commission, but it is of sufficient importance to justify a brief note. It was started about 23 years ago to make refined sugar from *gur*, using the molasses for the manufacture of alcohol. During the current year, 275,000 maunds of *gur* have been treated, yielding about 47 per cent of sugar.

Attached to the sugar works is a distillery capable of turning out 30,000 gallons of London proof spirit per month. The actual outturn in 1915-16 was about 134,000 gallons. Under the terms of the company's contract with Government, *mahua* spirit has also to be manufactured, so that there is a large surplus of molasses which cannot be used in the distillery and is sold in the bazaar.

The firm managing this factory have now turned their attention to the production direct from the sugarcane of *gur* for eating, and have set up new plant near Gorakhpur capable of dealing with five tons of cane per hour. This experiment is one of great interest, as it is possible that the solution of the Indian sugar question lies rather in the improvement of the manufacture of *gur* than in the development of central factories for the production and refining of sugar.

JOHN'S FLOUR MILLS, AGRA.

Visited 13th November 1916.

The mill has a capacity for 10½ sacks of flour per hour, and the machinery was supplied and erected by the firm of Henry Simon of Manchester. The plant is of a very simple character and is designed to supply the needs of the local market rather than to manufacture a high grade of flour. The wheat is broken down by corrugated rollers in three stages, whilst the semolina and middlings are reduced to fine flour and purified in four stages. The flow sheet of the mill is therefore a short one, but it is adequate for the purpose. Normally, the mill should produce from good wheat 50 per cent. flour, 32 per cent. *atta* and 18 per cent. bran; but usually rather more flour and *atta* are made and somewhat less bran, which means that the *atta* contains a good deal of finely ground offal and bran.

Indian wheat is notoriously dirty, and a wheat-cleaning plant is a *sine qua non*. That installed in the John's Mills, Agra, is very complete.

In England, one would expect to run this mill from 6 o'clock on Monday morning till 6 o'clock on Saturday evening; but here, the mill is only run through the hours of daylight as, apparently, the market is not big enough to absorb what might be considered the proper output of the mill. Nevertheless, the flour mill is said to yield a very good return to its owners. It is certainly well managed; the machinery was in excellent running order, and the manager appeared to be an experienced and intelligent man.

It may be noted that the manager of the Cawnpore Electric Supply Company stated that they were supplying power to a number of small stone mills electrically driven. These mills yield a product something like that turned out by the old English mills, many of which were run by wind power. The very elaborate system of gradual reduction of roller milling which superseded the old stone mill is totally unsuited to Indian conditions, and the comparatively simple plant at Agra seems to represent about the best that can be done for the Indian market on the roller system of flour milling.

THE FIROZABAD GLASS WORKS.

Visited 14th November 1916.

The Commission visited Firozabad to see the glass industry which is centred in that town. The industry is a very ancient one and is chiefly carried on to supply the innumerable glass bangles which Indian ladies of all classes wear till they become widows, when they have to eschew all ornaments. Formerly, the glass for the bangles was made from indigenous materials gathered more or less in the locality; but in recent years, since the manufacture of *chouri* glass was started at Rajpur, the use of local materials has been given up, and the glass is now made with imported soda, lime from Katni and sand from the country to the south of Allahabad. The coal of course comes from Bengal.

Bangle making is a very old Indian craft, but the indigenous industry has for a long time experienced the effects of unrestricted external competition; first it was Chinese bangles, then these were ousted by Austrian and now, since the war began, Japanese competition has proved very severe.

Firozabad possesses no natural advantages which tend to make it a centre of the glass trade, and it flourishes there almost entirely because of the hereditary skill of the glass bangle makers. The trade is divided into two branches, one devoted to the production of chouri glass which is in the hands of Hindu capitalists; the other, dealing with the *chouri* glass as the raw material, converts it into bangles. There are 6 or 7 factories for the production of glass, and between 50 and 60 for the production of bangles. The largest glass works in the town are just outside the railway station, and here the proprietors have installed a gas-heated furnace of quite a modern type. The factory is managed by an Austrian with the Italian name of Mozina. The glass manufactured is a very soft one obtained by the use of a considerable proportion of alkali. This is necessary because the bangle makers work at a comparatively low temperature and would be unable to deal with hard glass. For this reason, apparently, "cullet" or broken glass is not employed in Firozabad. The output of the furnace is about 100 maunds or nearly four tons of glass a day. The bangle makers work in gangs of from 12 to 20, round a central furnace fired with wood. The furnace is cheaply constructed of mud, and the temperature is not very high. Each bangle maker has an assistant, and the methods employed are exactly the same as, until recently, were in use in the south of India.

A Parsi firm, Messrs. B. Framroz & Co., have, since the outbreak of war, made considerable strides in the manufacture of bangles in imitation of those imported from Austria. They have discovered that suitable glazing materials can be obtained from England, and after a number of experiments have succeeded in constructing a muffle in which these glazes can be melted on to the bangles successfully.

The industry appears to be in a very flourishing state, evidence of which is visible in the glass factories, nearly all of which are provided with costly brick chimneys when cheap iron ones would do equally well. The industry appears to be in the hands of enterprising intelligent men who are willing to adopt any suggestions that seem to be practicable. As to the bangle makers, no deductions can be made from their workshops and equipment which are of the most primitive type; but as they can earn from twelve annas to Rs. 2 a day depending upon their skill, they are well off when compared with other Indian artisans.

Between 20 and 30 tons of glass bangles are the estimated daily output. The economics of the industry should be studied carefully. Till that is done, it would certainly be unwise for Government to intervene either to improve the industry in Firozabad or to establish it elsewhere.

The glass bangle industry may continue at Firozabad because of the hereditary workers and the fact that it is a recognised market for such goods. It may even expand if attention is concentrated upon improving the methods of manufacture and the introduction of new designs; but attempts to teach them glass-blowing are likely to fail as the workmen are very conservative and they have no experience of this branch of the industry.

It should be noted that in the glass industry there is but little waste of the raw materials in the processes of manufacture, and therefore the industry of glass blowing is best carried on in the neighbourhood of large markets for glassware, as the freight on the raw materials to the centre of consumption will be much less than on finished goods, which are not only very bulky but are also of a fragile character and require careful packing. A cheap supply of coal will undoubtedly prove an important factor in the successful establishment of a large glass industry and, combining this with easy access to the market, it seems that the coal districts of Bengal, which are close to Calcutta, are indicated as suitable for the establishment of this industry.

THE GOVERNMENT WEAVING SCHOOL, BENARES.

Visited 15th November 1916.

The Government Weaving School at Benares was started about 4½ years ago with a view to giving instruction in weaving. Rs. 75,000 is said to have been expended on the land and buildings, and the equipment probably cost half a lakh of rupees. Besides hand-loom weaving, there is a class the pupils of which are instructed in the working of hosiery machinery, the idea being that, having gone through a training extending over one year, they should be able to set up small hand-power hosiery factories for the manufacture of socks, stockings and vests. This class may be disposed of in a few words. Its aim is perfectly definite, and it is strongly supported by the makers of hosiery machinery who, through their agents in Lucknow, are prepared to sell the same on the hire-purchase system. The demand for hosiery is steadily increasing, and there seems to be no reason why, for a year or two, this class should not be successful. If the making of hosiery on these machines is profitable, the supply of such goods will soon exceed the demand, and there will be a glut in the market and a corresponding fall in prices. Hosiery machinery will change hands frequently, and people will get local instruction and the attendance in the school classes will probably fall off. The hosiery class should therefore be looked upon as a temporary measure, the utility of which is not likely to be prolonged.

The Weaving School must be regarded as a dismal failure. There was nothing being done in the School that is not ordinarily done much better in a bazaar and the machinery and plant in use in the School, which are not found in the bazaar, are quite unsuited to the conditions under which Indian hand-loom weaving is carried on. The Commission was informed that there were few boys belonging to the weaver community in the School, and it therefore seems more than doubtful if there is any advantage in giving elementary education in weaving to boys, who, if they become successful weavers, will simply swell the number depending upon hand-loom weaving for a livelihood.

There is evidence to show that the hand-loom weavers in India are using every year increasing quantities of yarn; but this is probably due to the increasing efficiency of their appliances rather than to any substantial increase in the numbers of the community. The actual number of working weavers is either stationary or possibly slowly decreasing. Weaving schools should be for the benefit of the artisans of the weaving community, and in this respect the Benares Weaving School is found wanting. As regards the training given in the School, it seems to be equally faulty.

The looms are divided into three classes, pit looms with the fly-shuttle slay, frame looms and pedal looms manufactured by Messrs. Hattersley and Son of Keighley. There were also a number of frame looms fitted with dobby or jacquard machines, but these were not at work. There is no objection to the pit looms or to the frame looms, but the former were only working on very narrow cloth which is not at all adapted to demonstrate the merits of the fly-shuttle slay. Hattersley looms are only a light type of power loom, modified so as to be worked with a treadle. These have been tried in many parts of India and have failed hopelessly, as the physique of the Indian weaver is not sufficient to enable him to drive these looms for more than a short time. A single power loom driven by an electro-motor is intelligible, but a power loom driven by an ill-fed cooly is an absurdity which could only be perpetrated in an educational institution. No work done in the School was shown to the Commission except plain weaving, and the most of it was not of a very high quality.

The School is said to cost Government about Rs. 27,000 a year, and only about Rs. 2,500 is recovered by the sale-proceeds of the work done. There may be a need for a weaving school in these provinces but it does not appear to be in Benares, and it is more than probable that the direction in which the hand-loom weaver needs assistance is not so much in the matter of improving the technique of his methods as in marketing the productions of his looms. There is a magnificent organisation in India for the sale of piece-goods, that is to say, the woven goods manufactured by power looms. Why there cannot be an equally good organisation for the sale of hand-woven goods is a question which requires to be investigated. If such an organisation could be created and the sphere of the hand loom definitely demarcated, the question of introducing improved technical processes would be an extremely simple one. It is, however, perfectly obvious that a Government weaving school will not solve the problem.

THE BIHAR SCHOOL OF ENGINEERING, BANKIPORE

Visited 16th November 1916.

The Bihar School of Engineering was founded in 1899, and is the concrete embodiment of local sentiment in favour of rendering Bihar independent of Bengal in matters of education. Local subscriptions amounting to 2½ lakhs of rupees provided the buildings and equipment and, though one might criticise the details, the general result of the expenditure is very satisfactory. Mr. Walford, the Principal of the School, joined in 1900, and to him is due the credit for organising the present courses of instruction. The School is designed to train overseers and sub-overseers for the Public Works Department and for District Boards and Municipalities. There is also a vernacular class for draftsmen and surveyors and classes for the training of artisans. Boys are admitted to the overseer classes on the results of an entrance examination, and the standard of general education required is that of the Calcutta University Matriculation examination. All the instruction is given in English. The principal feature of the curriculum is the very large amount of time which the boys spend in manual training, three hours every day being devoted to workshop practice and for a period of six weeks in a year the students are taken out into camp and put through a course of field instruction in surveying.

There seems to be an honest attempt to train the boys rather than to cram them with information. During the first year, they are taught carenptry, during the second, blacksmith's work, during the third, moulding and during the fourth, fitting and machine work. Those who satisfactorily pass through the School are then apprenticed for a year to Executive or District Engineers to get experience on actual work of construction. They receive no pay from the officers they serve; but are supported by stipends given by Government. The award of the diploma of the School depends upon a satisfactory report being received from the officer to whom they have been attached.

About 60 students are admitted every year, and the great majority leave at the end of the second year with a sub-overseer's certificate, and only 16 or 17 pass through the complete course of instruction. No very large amount of time is devoted to lectures or theoretical work. Although the students, when they leave the School, may not know so much as the equivalent students from other engineering colleges in India, it is probable that they are better trained.

The vernacular classes are meant to afford instruction in surveying and levelling and in drawing. In the artisan classes instruction is given to motor mechanics, carpenters, blacksmiths, moulders, painters and fitters. The workshops are under the management of a good English mechanic and are efficiently run. The income from the sale-proceeds yields a profit of about Rs. 5,000 over the extra cost entailed by these classes and is chiefly derived from repair work to, and painting of, motor cars. Since the constitution of Bihar and Orissa as a separate province, the School is unable to meet the local demand for trained engineering subordinates, and proposals are before the Government for enlarging the School.

All the boys in the subordinate classes live in a well appointed hostel; but the pupils of the artisan classes reside in the town. The School is pleasantly situated on the banks of the Ganges and may be regarded as an efficient and up-to date institution.

The Principal is a member of the Provincial Educational Service, and it is recognised that, as a member of that service, the highest pay he can obtain is inadequate, and he has therefore been given in addition personal allowances. This is not a satisfactory arrangement. If the School is to remain under the control of the Director of Public Instruction, the status should be recognised by making the Principal a member of the Indian Educational Service, especially as he is now the chief adviser on technical education in the province.

THE JAPAHA SUGAR COMPANY, MUZAFFARPUR.

Visited 22nd November 1916.

This factory is an example of the enterprise displayed by the Bihar planters when faced with ruin owing to the competition of synthetic indigo. They took to sugar planting. The cultivation was, of course, new to them, and they have hitherto followed the indigenous methods, and it yet remains to be seen how far the prospects of the industry can be improved when technical knowledge and skill is brought to bear upon the growing of the canes, similar to that which has been displayed in the manufacture of sugar. Under the indigenous system, the canes are crushed in bullock mills and the juice boiled down to either *rab* or *gur*. A country bullock mill worked with one pair of cattle will crush about a ton of cane a day, whilst the mill visited by the Commission crushes 12 tons of cane an hour and works continuously through the crushing season. Apart from the enormously increased capacity of a central station mill, an important advantage is gained by the much more efficient extraction of juice, which, in a plant of this type, with good cane, exceeds 80 per cent., as against 65 to 70 per cent. with the country mill.

It is open to question whether better financial results would not have been obtained by adopting the central station method for manufacturing a highly refined and purified *gur* on a very large scale. The native of India is accustomed to *gur* and the poorer classes, which form the bulk of the community, unquestionably prefer *gur*, to sugar. The difficulty with *gur* made by the ryots is that usually it is of an inferior quality and will not keep; but, by more perfect methods, a very much better article, as easily handled as sugar, can be turned out.

The sugar factory is situated about six miles from Muzaffarpur and is capable of dealing with 300 tons of cane a day. The crushing season commences in December and finishes in April. Assuming 120 working days and dealing with 300 tons a day, 36,000 tons of cane are dealt with. With an average crop of eight tons per acre, the sugar mill is capable of handling the produce of 4,500 acres. All the cane is brought to the mill by carts and on receipt at the factory it is weighed. Then it passes to the crushing rolls. These consist of two three-roller mills preceded by a pair of cane crushers. The juice is pumped to a sulphite box where it descends through a series of trays against an ascending current of sulphur-dioxide. By this means it is to some extent decolorised. It then passes into steam-jacketted defecators where lime is added, and the heavy impurities removed and carried to the scum tanks. From the defecators the juice is pumped into a series of eliminators where more lime is added to neutralise the acidity of the juice, which is then heated to boiling point, when the scum rises to the surface and is scraped off. The juice is then filtered through bag filters and passed into a triple effect evaporator where it is reduced to the consistency of a syrup. The final boiling is done in vacuum pans, and the massecuit resulting therefrom is passed into crystallisers, where it is kept in motion till it can be centrifugalled. The centrifugals are all water-driven. From the centrifugals the sugar is taken to the mixing floor, thence passed through a dryer and finally crushed, when it is packed and carried to the warehouse. The molasses from the first sugars are treated again, and a second sugar produced of a slightly inferior quality; the runnings from the second sugar are allowed to settle, and any sugar crystallising out is sent to the defecators and re-treated.

The machinery and plant were supplied by the Harvey Engineering Company of Glasgow and, though not of a very elaborate character, the equipment is of a first-rate quality. No information is obtainable regarding the percentage of juice extracted from the cane, and this is probably not very high. The megasse is burnt under the boilers used for raising steam, but is insufficient, and about 500 tons of coal and a certain amount of wood in addition are used is each season. There is a local demand for the molasses which are disposed of locally through a contractor, who takes them away in kerosene oil tins. This mill was one of the earliest erected in Bihar, and as much as Rs. 2-8-0 a maund was paid for the molasses. Last year, the price realised was about Rs. 1-12-0 a maund which is now considered very good.

THE CUTLERY FACTORY, MUZAFFARPUR.

Visited 24th November 1916.

Mr. M. Bose, the proprietor of this factory, has submitted evidence to the Commission detailing the reasons which led him to take up this industry. The factory is a small shed in which about a dozen men are working, and the value of the outturn is estimated at Rs. 15 a day. The proprietor claims a large amount of credit for having trained his own workmen ; but it is doubtful if he has done more than get together a few hereditary artisans and supply them with work. In support of this suggestion it may be mentioned that there is another man making cutlery in the town, but he is not a graduate of the Calcutta University. Some of the articles made in this factory are of excellent quality, and, although the methods of manufacture are primitive, they are not much below the standard which prevailed in the cutlery trade in Sheffield, till more mechanical methods were introduced under pressure of competition from Solingen and America.

India might well be the home of a large cutlery trade, as it is an industry which does not require a very large amount of capital and depends much upon the skill of the artisans engaged in it. There are large numbers of such men scattered all over India, the descendants of the armourers and gunsmiths of the past. The capacity of Mr. Bose's factory could be greatly increased by the installation of a small oil engine to drive the grinding machinery and buffs, whilst light drop hammers might possibly be employed with advantage in forging the knife blades. Mr. Bose is unfortunately very deaf and is far from being a business man; but he is an enthusiastic pioneer, and it is possible that, with some kind of business control, he would do more useful work.

The raw materials used are old files and buffer springs, both of which can be obtained from dealers in old metals at reasonable prices. It would probably require a not very large development of the cutlery trade to exhaust this source of supply; but it should, at no time, be difficult to get cutlery steel of the requisite quality.

THE BENGAL PRESERVING COMPANY, MUZAFFARPUR.

Visited 24th November 1916.

The proprietor of this factory is Babu Basantacharan Sinha, a pleader in Muzaffarpur, who deserves great credit for establishing the fruit canning industry in Bihar and working it up to a profit-earning stage. The Commissioner of Tirhut Division has furnished information regarding the history of this enterprise which need not be repeated. A visit to the factory discloses evidences of its amateur origin. It is badly arranged, and the processes of manufacture are not carried out in suitable buildings. There is not that assurance of scrupulous attention to cleanliness which is essential in a factory preparing preserved fruits. The proprietor is not a business man and seems to experience unnecessary difficulty in obtaining the credit necessary to carry on this business.

The processes employed are up-to-date, and canned fruits and jams are turned out of excellent quality. At the present time the proprietor is manufacturing largely for British troops in Mesopotamia, and the business is now yielding him good profits. He wants no help from Government, but the stability of the industry would probably be greatly enhanced by the assurance of continued support from the Commissariat branch of the Military Department after the war is over, provided the standard of quality now reached is maintained.

THE SALTPETRE REFINERY, MUZAFFARPUR.

Visited 25th November 1916.

The saltpetre refinery visited by the Commission at Muzaffarpur turns out about 500 tons of refined saltpetre per annum and is said to be one of the largest in the province. The *nooniah* brings crude saltpetre to the factory, and this is dissolved in mother liquor from the crystallising vats and concentrated in large open pans over slow burning fires. The potassium nitrate, being more soluble than sodium chloride, remains in solution and when the sodium chloride has been thrown down, the liquor is drawn off into crystallising troughs. Here it cools very slowly, and the growth of crystals on the surface proceeds rapidly. In about three days all the recoverable saltpetre, due to the difference in solubility of hot and cold solutions, is recovered. The mother liquor is then used to dissolve a further lot of crude saltpetre. All the impurities removed in the processes of refining are heaped together and re-treated at intervals, as, apparently, when mixed with nitrous earth, a further conversion of organic nitrogen into nitric acid takes place.

The factory at Muzaffarpur covers several acres, and at first sight the processes appear to be crude and the methods of manufacture capable of considerable improvement. The labour factor, however, is not important as wages are very low. The recovery of refined saltpetre must, however, be extremely efficient, as whatever comes into the factory remains there and is re-treated at intervals. These saltpetre refineries suffer from the exactions of the petty officials of the Salt Department. From 10 to 20 per cent. of common salt comes in with the potassium nitrate and this can be recovered in apparently a sufficiently pure form to be fit for human consumption. Mr. C. M. Hutchinson, the Imperial Agricultural Bacteriologist, has published a study of the processes employed by the *nooniah* in Bulletin No. 68 of the Agricultural Research Institute, Pusa, and, still earlier, the methods employed in obtaining saltpetre have been described by Messrs. Leather and Mookerjee in Bulletin No. 24 of the same series.

THE TITAGHUR PAPER MILLS, TITAGHUR.

Visited 29th November 1916.

	Rs.
Capital (Paid-up)	25,85,000
Debentures	15,00,000
Block Account	51,97,423
Reserves	24,22,423

These mills are now turning out 1,700 tons of paper a month and employ six Fourdrinier machines. The raw material is *sabai* grass, but wood pulp is also imported from Norway and Japan. Experiments have been made with bamboos with fairly good results. Paper was recently made from 16 tons of bamboos supplied by the Mysore Government from the bamboo jungles in the Shimoga District. At present prices it is doubtful if such a source of supply could be commercially used, even if the bamboos were converted into pulp on the spot.

These paper mills appear to have grown up, and they probably require to be entirely remodelled to obtain the best results. For the past four years they have paid no dividend; but now, owing to the war, they are making a large profit, and their chief difficulty is to get sufficient supplies of grass at remunerative rates.

THE TITAGHUR JUTE MILLS, TITAGHUR.

Visited 29th November 1916.

	£
Capital	300,000
Debentures	98,451
Block Account	803,913
Reserves	468,019
No. of Looms	1,718

These mills were started in 1906 and may be regarded as representative of the industry at the present time. The mills run 13½ hours a day, but the operatives, by an arrangement of shifts, only work two-thirds of that time. A very large number of half-timers, working not more than six hours a day, are employed chiefly in connection with the spinning frames.

The mill stores consumed are worth many lakhs a year and are at present imported. There is no reason, except want of enterprise, why belting, picker bands, pickers and roller leather should not be made in the country. As regards bobbins, it is only necessary to find a suitable wood, obtainable at a reasonable cost, and import the requisite wood-working machinery.

The local housing of the coolies is to be commended, the rent for single rooms being only four annas a week on the ground floor and six annas a week upstairs. These mills are very spaciously planned, and there is no overcrowding.

THE CALCUTTA POTTERY WORKS, CALCUTTA.

Visited 30th November 1916.

This note is based upon the impressions formed during a somewhat hurried visit to these works. and it is possible that the conclusions might be modified by a more detailed study of the problems, the solution of which is essential to the successful development of what is obviously a very promising concern. The pottery, according to the report of Mr. J. G. Cumming published in 1908, is the result of the associated enterprise of the Maharajah of Kasimbazar and Rai Bahadur Baikanta Nath Sen of Berhampore, and it has been in operation for at least ten years.

The capital invested in the concern is stated to be about 2⅓ lakhs of rupees, and the turnover amounted last year to roughly one half this amount, and a profit of 9 per cent. on the whole capital outlay was made. There is no doubt that the outturn, compared with the amount of money invested in the factory, is very low and, since a fair profit has been made on the capital outlay, it is not unreasonable to assume that the prices charged for the manufactured goods are high, and it is possible that there would be a much larger demand if the prices could be lowered.

The manager of the factory, Mr. Deb, has been trained in Japan and Germany, and in the arrangement and lay-out of the plant, which may be described as exceedingly good, he has largely followed German ideas. The equipment of the machinery, so far as it goes, appears to be very complete; but the bulk of it at the time of our visit was not at work. There are three Japanese kilns and one large German kiln divided into three floors. Only one Japanese kiln was under fire, and all the others were empty and cold.

This suggests that the capacity of the factory is considerably in excess of the demand for the goods manufactured, and that more attention should be paid to developing the business in such goods as can be made.

The outturn consists chiefly of ornamental figures and toys which are prepared in a very up-to-date system of plaster moulds. Although one may not admire the taste which creates a demand for such goods, there is no doubt that it has been met with very great technical skill.

Of much greater interest, from a business point of view, is the output of utilitarian articles, chiefly porcelain insulators and fittings for house wiring and insulators for telegraph posts. These seem to be quite satisfactory, and there is a growing demand for the same; but whether this is consequent upon war conditions or whether the articles can really compete in the open market with similar goods, it is difficult to say.

The specimens of common domestic chinaware shown to us disclosed the fact that the technique of their manufacture was imperfect and that a suitable body had not been discovered, as the finish was rough and nearly every article was distorted, consequent upon the high temperature at which they had been fired. It is obvious that more experimental work is necessary to improve the quality of these goods, and it is in this direction that further experimental work should be carried on.

It seems desirable that in the immediate future efforts should be confined to the improvement of the present wares, rather than that attempts should be made to develop business in new directions. The development of the factory will obviously require the further installation of machinery and plant; but there is more than a shadow of doubt as to whether the present manager, Mr. Deb, is capable of solving the difficulties which lie in front of him. He has certainly already displayed so much capacity that one would be inclined to give him a further trial; but it is just possible that he has reached the end of his tether and that any further capital outlay will be ultimately wasted. He seems to be firmly convinced that it is only a little more capital that is required to develop his business; but the amount of capital invested in it already is very considerable and better results both from a business point of view and technically might well be expected before any further additions are made.

THE PEN AND PENCIL FACTORY OF MESSRS. F. N.GOOPTU & CO., CALCUTTA.

Visited 5th December 1916.

This factory is an interesting example of one of the most successful attempts at *swadeshi* enterprise. The capital outlay on buildings and plant exceeds three lakhs of rupees, and there are three complete sets of machinery installed for making (1) lead pencils, (2) pen holders and (3) pens.

No suitable Indian wood has been found for the pencils, and supplies are imported from Mombasa, the wood used being a species of cedar which costs Rs. 275 a ton delivered in Calcutta. The graphite is obtained from Ceylon and is washed and mixed in the factory, three grades of lead being prepared for hard, medium and soft pencils. The machinery used in this part of the factory is of German origin and is not capable of turning out a very highly finished article; nevertheless, with the wood employed, a very satisfactory cheap pencil is produced, which sells now at Rs. 2-4-0 a gross, and at that price it should yield a good profit. The outturn is about 35 gross per day of eight hours, and the demand is considerably in excess of any possible outturn.

The machinery for making pen holders and nibs consists of circular saws for cutting up the wood, of automatic lathes for turning it and of hand presses for metal work. Most of this is of English origin. In addition there are one or two turret lathes and other machine tools for preparing dies, for the manufacture of which the factory is very completely equipped. This is a very satisfactory feature as it renders the factory independent of Europe or America, and should enable it readily to prepare a much greater variety of goods.

The finishing plant, consisting of muffles, annealing furnaces, polishing drums and nickel-plating baths, is very complete. Finally a considerable amount of care has been devoted to packing the goods in an attractive way and in this respect they do not suffer, when compared with imported goods of similar quality.

The factory is now said to be yielding a good profit ; but how much, was not stated. The quality of the work turned out depends less upon the skill of the artisans employed than upon the quality of the machine tools. In this matter, the tool-making department is therefore of the greatest importance, and Mr. Gooptu may be congratulated upon the practical way in which he has recognised this fact. The Bengal workmen do not strike one as particularly skilful in handling the tools. Many of the presses appear to be unnecessarily heavy for the work to be done, and their output is consequently somewhat small.

The weak point in this factory, under war conditions, is that it is entirely dependent upon Europe or America for supplies of suitable raw material in the metal section ; but apparently, so far, no difficulty has been found in this respect.

As already mentioned, the factory only works eight hours a day, and it is difficult to understand why greater advantage is not taken of the present extremely favourable conditions to work at least a double shift and thereby double the outturn.

MESSRS. JESSOP & COMPANY'S IRON WORKS, HOWRAH.

Visited on the 6th December 1916.

The iron works are situated at Howrah on the banks of the Hooghly just to the north of the floating bridge. The company has also carriage and wagon works at Kidderpore. The Howrah shops are laid out to deal with constructional iron work ; but owing to the war, such material is not available in large quantities, and the amount of work of this character in progress was therefore small, and chiefly on Government account for use in Mesopotamia. On the other hand, the abnormal conditions have brought a large amount of work of an unusual character to these shops. 4½ inch steel shells were being drawn in a powerful hydraulic press, and the company was making 100 looms for a jute mill. Other machinery such as small winding engines was also under construction and generally, there was ample evidence of such enterprise as was possible on the part of the firm to deal with an extremely difficult situation. In general terms, the shops may be described as up-to-date and adequately equipped with sufficient tools and plant.

THE BENGAL NATIONAL TANNERY, CALCUTTA.

Visited 12th December 1916.

This tannery is the private property of the Hon'ble Dr. Nil Ratan Sircar and is situated at Baliaghata on the outskirts of Calcutta. The manager of the tannery, Mr. B. M. Das, was sent to England with a University scholarship and studied for two years at Leeds University, subsequently working in a tinctorial laboratory in Germany and at a tannery in Italy.

The tannery is mainly devoted to the manufacture of chrome upper leathers ; but bark tanning is also done on a limited scale, splits being so treated and also sole leather. Attached to the tannery is a boot factory provided with a considerable number of machines. Dr. Sircar states that from first to last he has spent about two lakhs of rupees on this tannery and that it now yields him about five per cent on his capital outlay, the outturn of the factory being worth approximately Rs. 20,000 a month.

Leather of very good quality is turned out, and the boots, shoes and slippers may be described as good country-made articles, that is to say, they are strong and durable but lack finish. The workmen are principally Chamars; but there are also some caste people employed. The machinery is of a good class, and the tanning drums are well made, though of local manufacture. The engineering part of the work is not of a high order, and the tanning drums are run at an unnecessarily high speed. It is understood that Dr. Sircar ventured upon this business purely from patriotic motives, and it is perhaps a pity that besides attempting to demonstrate the feasibility of starting chrome tanning in Bengal, he should not have been equally keen on showing that he could make money. That he has obtained his main object, there can be no doubt; but the profit obtained on the turnover is much less than might have been reasonably expected. About 20 per cent of the leather made in the tannery is used in the boot factory, and it may be suggested that much better results would have been obtained by employing the capital invested in the boot factory on developing the tannery. Without a detailed examination of the accounts, it is of course impossible to say whether both branches of the business have been worked at a profit or whether one branch is absorbing the profits made in the other. It does not follow because a man is a successful tanner and has a good commercial knowledge of the business that he will be equally successful in the manufacture of boots and shoes. These trades are quite separate, and it is distinctly unfortunate that in India chrome tanners should have blindly followed the procedure which was originally adopted in Madras. There, where the industry was first started, it was absolutely essential to open a department for the manufacture of goods from the leather turned out by the tannery. At that time, Indian chrome leather was either unknown or was viewed with great suspicion by manufacturers of leather goods, and it was necessary to demonstrate the suitability of chrome-tanned leather for Indian requirements. The need for such no longer exists, and tanneries and boot factories should be separate commercial undertakings. Specialisation is essential if Indian factories are to compete in the open markets of the world, and the sooner this is recognised the more rapid progress will be.

From his previous history; it may be assumed that Mr. Das is a scientific tanner and is a master of the trade; but it is doubtful if he is equally conversant with the manufacture of boots and shoes.

The Members of the Commission have now visited three factories in Calcutta, the products of the swadeshi movement. These are the Calcutta Porcelain Factory, the Pen and Pencil Factory belonging to Mr. F. N. Gooptu and the National Tannery. All three have entered the profit earning stage. Each is unquestionably open to considerable criticism, either in regard to the quality of the work turned out or the business management; but each may be regarded as a promising industrial concern. The success so far achieved should afford ample encouragement for the development of these enterprises; but that development should be in the direction of increased specialisation and the tendency to diffuse efforts over a wider field should be sternly resisted.

SCHOOL OF HANDICRAFTS, NAGPUR.

Visited 15th December 1916.

This is a rather unique type of industrial School, the aims and objects of which are fully described in the prospectus furnished to the Members of the Commission who visited the School and supplemented by the evidence tendered by the superintendent, Mr. E. Cove.

The School proper contains two departments, one devoted to carpentry and the other to blacksmith's work with a little turning and fitting. All pupils of the School must be the sons of artisans and in granting admission, preference is given to boys coming from villages. The course of instruction was originally three years, but has now been reduced to two years, and the age limit of admission raised to 16. The work done by the boys in the School is extremely good and is evidence of the efficiency of the instruction. There can be no doubt that the policy of restricting admissions to the sons of artisans is thoroughly sound; but it is questionable whether the training given in the School goes far enough and deep enough to turn out a really good class of superior artisan. It seems improbable that the village carpenters will go back to village life and that if they want to utilise their superior attainments, they will have to find employment in towns or cities, where there is a demand for carpentry and cabinet work. On the other hand, with the development of rural engineering, which is in progress in the Central Provinces, there should, in the

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